

What is claimed is:

1. A processing apparatus for removing an oxide film from a surface of an object to be processed, the processing apparatus comprising:

5 a processing container accommodating the object to be processed therein;

an active gas species generating unit for producing active gas species;

a heater arranged outside the processing container to heat the object to be processed;

10 a transparent window formed in the processing container between the heater and the object to be processed, the transparent window sheltering the interior of the processing container from the outside in an airtight manner and also allowing heating energy from the heater to pass through; and

15 a shielding plate provided in such a way that the shielding plate can be inserted into or extracted from a gap between the object and the transparent window;

wherein, on condition that the shielding plate is closed to insulate irradiation heat radiated from the transparent window, the processing apparatus allows the oxide film formed on the surface of the object to react with the active gas species, thereby forming a product film; and subsequently,

20 the processing apparatus opens the shielding plate so as to apply irradiation heat irradiated from the heater to the product film through the transparent window and further heats the product film to a predetermined temperature for vaporization, thereby removing the product film.

25

2. A processing apparatus for removing an oxide film from a surface of an object to be processed, the processing apparatus comprising:

30 a first processing chamber having an active gas species generating unit for producing active gas species and also allowing the oxide film formed on the surface of the object to react with the active gas species under a condition of low temperature, thereby forming a product film;

a second processing chamber having heater for heating the object to be processed and allowing the heater to heat the product film formed on the surface of the object to a predetermined temperature for vaporization, thereby removing the product film; and

35 transporter for transporting the object between the first processing chamber and the second processing chamber.

002260-8979960

sub 102

3. A processing apparatus as claimed in Claim 1 or 2, wherein the active gas species are active gas species of  $\text{NF}_3$  gas.
- 5 4. A processing apparatus as claimed in Claim 1, wherein the shielding plate is provided with cooler for cooling the shielding plate itself.
5. A processing apparatus as claimed in Claim 2, wherein the transporter is arranged in a transfer chamber connected to the first processing chamber and the  
10 second processing chamber and also filled up with a non-reactive atmosphere inside.
6. A processing apparatus as claimed in Claim 1 or 2, wherein  
the active gas species generating unit includes:  
15 a plasma generating tube having a plasma generating part;  
a plasma gas introducing part for supplying both  $\text{N}_2$  gas and  $\text{H}_2$   
gas into the plasma generating tube; and  
a  $\text{NF}_3$  gas supplying part for adding  $\text{NF}_3$  gas to the active gas  
species flowing down from an interior of the plasma generating tube.  
20
7. A processing apparatus as claimed in Claim 6, wherein  
the plasma generating part comprises a microwave generating source for  
generating microwaves and a waveguide for introducing the so-generated  
microwaves into the plasma generating tube.  
25
8. A processing method of removing an oxide film from a surface of an  
object to be processed while using a processing apparatus which includes a  
processing container accommodating the object to be processed therein, a heater  
arranged outside the processing container to heat the object to be processed, a  
30 transparent window formed in the processing container between the heater and  
the object to be processed, and a shielding plate provided in such a way that the  
shielding plate can be inserted into or extracted from a gap between the object  
and the transparent window, the processing method comprising the steps of:  
allowing the oxide film formed on the surface of the object to react with  
35 active gas species under a condition of low temperature on condition that the  
shielding plate is closed to insulate irradiation heat irradiated from the transparent  
window, thereby forming a product film; and subsequently,

09667768-092200

opening the shielding plate and applying irradiation heat irradiated from the heater to the product film through the transparent window to heat the product film to a predetermined temperature for vaporization, thereby removing the product film.

5

9. A processing method of removing an oxide film from a surface of an object to be processed, the processing apparatus comprising:

allowing the oxide film formed on the surface of the object to react with active gas species under a condition of low temperature in a first processing

10 chamber, thereby forming a product film;

transporting the object having the product film formed thereon from the first processing chamber to a second processing chamber; and

heating the product film formed on the surface of the object in the second processing chamber, to a predetermined temperature for vaporization, thereby

15 removing the product film.

Add  
A3

002260" 8979960